REMARKS

Claims 1-18 were pending prior to entry of amendments herein. Claims 1, 10, 11, and 16 are amended herein. Claims 6, 7, and 15 are canceled.

Claim Objection

Claim 10 is objected to for an informality. The typographical error in Claim 10 has now been corrected to overcome this objection, in accordance with the Examiner's suggestion

Rejections Under 35 U.S.C. §103

Claims 1, 4-6, 8-15, 17, and 18 are rejected under 35 U.S.C. §103(a) as being unpatentable over Creutz et al., U.S. Patent No. 4,110,176 in view of Andricacos et al., U.S. Patent No. 5,516,412 and Rodbell et al., U.S. Patent No. 6,344,129. Claims 2 and 3 are rejected under 35 U.S.C. §103(a) as being unpatentable over Creutz et al. in view of Andricacos et al. and Rodbell et al., and further in view of Carl et al., U.S. Patent No. 6,436,267. Claims 1 and 4-18 are rejected under 35 U.S.C. §103(a) as being unpatentable over Creutz et al. in view of Uzoh et al., U.S. Patent No. 6,354,916 and Rodbell et al. Claims 2 and 3 are also rejected under 35 U.S.C. §103(a) as being unpatentable over Creutz et al. in view of Uzoh et al. and Rodbell et al., and further in view of Carl et al.

Claim 1 has been amended to recite applying an external influence to contact the top portion and that the low temperature environment is maintained while applying the external influence and processing the conductive top surface. This amendment is fully supported by the specification, as originally filed, at, for example, paragraphs [0039]-[0043]. Claim 11 has been amended to recite applying an external influence to contact the top portion and sweeping the conductive surface with the external influence while wetting the conductive surface with the chilled electrolyte solution. This amendment is fully supported by the specification, as originally filed, at, for example, paragraph [0046]. Claims 6, 7, and 15 are canceled and dependent Claim 16 has been amended to depend from Claim 11.

Creutz et al. teach the use of additives in electroplating baths. However, as noted by the Examiner, Creutz et al. do not teach or suggest (1) electroplating on a substrate that includes a conductive surface with a top portion and a cavity portion, (2) applying an external influence to

the top portion, the external influence removing a portion of the additive adsorbed on the top portion, or (3) maintaining a low temperature processing environment.

Similarly, Andricacos et al. do not teach applying an external influence to contact the top portion, the external influence removing a part of the first amount of the additive adsorbed on the top portion, as recited in amended Claims 1 and 11. As shown in Figs. 1-3 of Andricacos et al., a paddle 28 is positioned near the surface of the workpiece article 14 to be plated, but is not applied to the top surface of the workpiece article 14. Andricacos et al. teach the use of the paddle 28 merely to agitate electrolyte 24 during electroplating "to diminish adverse plating effects from buoyancy or gravity induced convection." Andricacos et al., at Col. 4, lines 44-48. Thus, Andricacos et al. do not teach to apply an external influence to contact the top portion of the conductive surface, the external influence removing a part of the first amount of the additive adsorbed on the top portion, as the Andricacos et al. paddle 28 merely agitates the electrolyte 24 near the article 14 and never contacts the article 14. Furthermore, there is no suggestion in Andricacos et al. of additives in the electrolyte, removal of any such additives from the top portion, or maintaining a low temperature processing environment or using a chilled electrolyte.

As noted by the Examiner, Rodbell et al. teach electroplating in a low temperature environment. Rodbell et al. teach to use a low temperature environment to lower dopant levels in a plated copper film and that the lower dopant levels contribute to a fast resistivity transient and allow "both adequate fill and low resistance films to be simultaneously achieved." Rodbell et al., at Col. 6, lines 6-14; *see* also Rodbell et al., at Col. 5, lines 46-49. Rodbell et al. teach using low temperature and a solution with a lower additive concentration, but do not teach use of an external influence nor removing a part of the additives to create a planar layer. Therefore, Rodbell et al. do not satisfy the deficiencies of Cruetz et al. and Andricacos et al. discussed above.

Claims 1 and 4-18 are rejected under 35 U.S.C. §103(a) as being unpatentable over Creutz et al. in view of Uzoh et al., U.S. Patent No. 6,354,916 and Rodbell et al. Uzoh et al. do not teach or suggest applying an external influence to contact the top portion, the external influence removing a part of the first amount of the additive adsorbed on the top portion. The Examiner contends that "the polishing pad of Uzoh et al. would have been expected to have performed this function since it disturbed to[sic] the top portion of the conductive surface."

Applicant submits that Uzoh et al. teach a modified plating solution in which oxidizers are added for the purpose of allowing a plated layer to be polished more easily. Thus, Uzoh et al. suggest that these oxidizers are desirable in the plated layer and therefore provide no motivation for removing any additive adsorbed on the top portion. Uzoh et al. teach to apply a fixed abrasive pad 8 to the conductive surface, not for the purpose of removing any adsorbed additives, but for the purpose of reducing the plating rate and to suppress the accumulation of the metal layer. *See* Uzoh et al. at Col. 7, lines 7-22. Thus, there is no motivation to use the Uzoh et al. polishing pad in combination with Cruetz et al. and Rodbell et al. Furthermore, Uzoh et al. do not teach or suggest sweeping the conductive surface with the external influence while wetting the conductive surface with the chilled electrolyte solution or while maintaining a low temperature environment. Only Applicant has recognized the benefit of a low temperature environment or chilled electrolyte slowing down the re-adsorption rate of the additives in the claimed combination. As Uzoh et al. suggest that the oxidizers are desirable in the plated layer, the skilled artisan would have no motivation to combine a low temperature environment or chilled electrolyte with the Uzoh et al. process.

Thus, none of the cited references provide any motivation for combining the Creutz et al. solution and Andricacos et al.'s paddle (which does not meet the "contact" limitation anyway) or Uzoh et al.'s pad 8 to sweep the conductive surface, with Rodbell et al.'s low temperature process to form a planar layer. Claims 1 and 11, as amended, are therefore patentable over Creutz et al., Andricacos et al., Uzoh et al., and Rodbell et al., either alone or in combination. Claims 4, 5, 10, 12-14, 17, and 18, which depend from and include all of the limitations of Claim 1 or Claim 11, as amended, are also patentable. Furthermore, each of the dependent claims recites further distinguishing features of particular utility.

As discussed above, amended Claims 1 and 11 are patentable as there is no motivation or suggestion to combine the Creutz et al. solution and Andricacos et al.'s paddle (which does not meet the "contact" limitation anyway), with Rodbell et al.'s low temperature process to form a planar layer. Carl et al. disclose an electrochemical deposition process using an electrolyte, but Carl et al. do not teach or suggest using additives or using an external influence to contact the surface. Furthermore, Carl et al. merely mention that temperature controls may be provided adjacent the substrate support "to maintain substrate temperature at a desired temperature during

processing." As discussed above, there is no suggestion in Carl et al. of additives in the electrolyte nor sweeping the conductive surface. Thus, there cannot be any suggestion in Carl et al. of using a low temperature environment or chilled electrolyte while contacting the conductive surface with an external influence. As noted above, only Applicant has recognized the benefits of lower temperature environment or chilled electrolyte slowing down the re-adsorption rate of the additives in the claimed combination.

Double Patenting Rejection

Claims 1-18 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Claims 1-30 of U.S. Patent No. 6,534,116 in view of Rodbell et al., U.S. Patent No. 6,344,129. Applicant respectfully disagrees that Claims 1-18 are unpatentable over Claims 1-30 of the '116 patent.

As discussed above, Rodbell et al. teach to use a low temperature environment to lower dopant levels in a plated copper film and that the lower dopant levels contribute to a fast resistivity transient and allow "both adequate fill and low resistance films to be simultaneously achieved." Rodbell et al., at Col. 6, lines 6-14; *see* also Rodbell et al., at Col. 5, lines 46-49. Rodbell et al. merely teach using low temperature and a solution with a lower additive concentration, but do not teach any use of an external influence to contact the conductive surface nor to remove a part of the additives adsorbed on the surface to create a planar layer. Thus, Applicant respectfully submits that there is no motivation to combine the claims of the '116 patent with Rodbell et al. and respectfully traverses this double patenting rejection.

Conclusion

Applicant respectfully submits that all of the pending claims are patentably distinguishable over the prior art of record. The cited references, either alone or in combination, do not teach or suggest Applicant's claimed invention.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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AMEND

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